

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions of claims in the application.

Listing of Claims:

1.-6. (Cancelled)

7. (Currently amended) A device for determining luminescent molecules by means of optical excitation in confocal measuring volumes, comprising:

- a) a carrier arrangement (9) for holding a sample (12) that contains molecules to be determined,
- b) an optical excitation device (2, 4, 6, 8) for providing multiple light beams and, in particular, comprising at least one light source (2), at least one passive or active diffractive optical element (7) for splitting penetrating light into multiple beams, and a focusing optics (8) for focusing penetrating multiple light beams into multiple confocal volume elements in the respective measuring volume for the purpose of exciting luminescence in the multiple confocal volume elements,
- c) an optical detection device (20) for detecting luminescence from the confocal volume elements, the optical detection device comprising a spatially resolving sensor matrix of avalanche photodiodes AD that is produced using IC technology, in particular CMOS technology, and is integrated in a sensor chip (20) with Geiger mode wiring, for capturing emitted radiation from the multiple confocal volume elements, and

d) signal processing and evaluation means for processing the signals provided by the avalanche photodiode matrix, wherein said signal processing and evaluation means are integrated in the sensor chip (20).

8. (Cancelled)

9. (Previously presented) The device for determining luminescent molecules as claimed in claim 7, in which the signal processing and evaluation means comprise at least one correlator, preferably a number of correlators, for carrying out signal correlation operations, in particular for determining autocorrelation functions or/and cross-correlation functions of first or/and higher correlation orders of measuring signals.

10. (Previously presented) The device for determining luminescent molecules as claimed in claim 7, in which the signal processing and evaluation means comprise circuits for carrying out a fast Fourier transform of the measuring signals.

11. (Previously Presented) A device for determining luminescent molecules by means of optical excitation in confocal measuring volumes, comprising:

- a) a carrier arrangement (9) for holding a sample (12) that contains molecules to be determined,
- b) an optical excitation device (2, 4, 6, 8) for providing multiple light beams and, in particular, comprising at least one light source (2), at least one passive or

active diffractive optical element (7) for splitting penetrating light into multiple beams, and a focusing optics (8) for focusing penetrating multiple light beams into multiple confocal volume elements in the respective measuring volume for the purpose of exciting luminescence in the multiple confocal volume elements,

c) an optical detection device (20) for detecting luminescence from the confocal volume elements, the optical detection device comprising a spatially resolving sensor matrix of avalanche photodiodes AD that is produced using IC technology, in particular CMOS technology, and is integrated in a sensor chip (20) with Geiger mode wiring, for capturing emitted radiation from the multiple confocal volume elements, and

d) signal processing and evaluation means for processing the signals provided by the avalanche photodiode matrix (20), wherein said signal processing and evaluation means are integrated in the sensor chip (20), and said signal processing and evaluation means comprise at least one correlator, preferably a number of correlators, for carrying out signal correlation operations, in particular for determining autocorrelation functions or/and cross-correlation functions of first or/and higher correlation orders of measuring signals.

12. (Currently amended) A device for determining luminescent molecules by means of optical excitation in confocal measuring volumes, comprising:

a) a carrier arrangement (9) for holding a sample (12) that contains molecules to be determined,

b) an optical excitation device (2, 4, 6, 8) for providing multiple light beams and, in particular, comprising at least a plurality of penetrating light beams, and a focusing optics (8) for focusing said plurality of penetrating light beams into multiple confocal volume elements in the respective measuring volume for the purpose of exciting luminescence in the multiple confocal volume elements,

c) an optical detection device (20) for detecting luminescence from the confocal volume elements, the optical detection device comprising a spatially resolving sensor matrix of avalanche photodiodes AD that is produced using IC technology, in particular CMOS technology, and is integrated in a sensor chip (20) with Geiger mode wiring, for capturing emitted radiation from the multiple confocal volume elements, and

d) signal processing and evaluation means for processing the signals provided by the avalanche photodiode matrix (20), wherein said signal processing and evaluation means are integrated in the sensor chip (20), and said signal processing and evaluation means comprise at least one correlator, preferably a number of correlators, for carrying out signal correlation operations, in particular for determining autocorrelation functions or/and cross-correlation functions of first or/and higher correlation orders of measuring signals.

13. (New) The device for determining luminescent molecules as claimed in claim 9, wherein said at least one correlator is configured to calculate a cross-correlation of two or more wavelengths of said luminescence detected by said optical detection device.

14. (New) The device for determining luminescent molecules as claimed in claim 11, wherein said at least one correlator is configured to calculate a cross-correlation of two or more wavelengths of said luminescence detected by said optical detection device.

15. (New) The device for determining luminescent molecules as claimed in claim 11, in which the signal processing and evaluation means comprise circuits for carrying out a fast Fourier transform of the measuring signals.

16. (New) The device for determining luminescent molecules as claimed in claim 12, wherein said at least one correlator is configured to calculate a cross-correlation of two or more wavelengths of said luminescence detected by said optical detection device.

17. (New) The device for determining luminescent molecules as claimed in claim 12, in which the signal processing and evaluation means comprise circuits for carrying out a fast Fourier transform of the measuring signals.